MULTIMEDIA **UNIVERSITY**

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FINAL EXAMINATION

TRIMESTER 1, 2018/2019

PSM0325 – INTRODUCTION TO PROBABILITY AND STATISTICS
(Foundation in Information Technology / Life Sciences)

27 OCTOBER 2018
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **THREE** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.

4. **Statistical table** is provided.

Instruction: Answer all **FIVE** questions.

Question 1 (10 marks)

The score obtained by the students in an exam are shown in the table below:

Exam Score	Frequency
30 - 39	1
40 - 49	0
50 - 59	5
60 - 69	4
70 - 79	15
80 -89	5
90 - 99	7

  a. Sketch the bar chart for the above data.   (2 marks)
  b. Construct a table with the given guideline: (3 marks)

Score	m	f	mf	m²f

  c. Calculate the mean and standard deviation.   (3 marks)
  d. Calculate the percentage relative frequency for the score less that 60.
                      (2 marks)

Question 2 (10 marks)

a. The probability density function of a discrete random variable X is defined as:

$$f(x) = \begin{cases} k & ,x = 2,3 \\ kx - 2 & ,x = 1,5 \\ 0 & otherwise \end{cases} \quad \text{where } k \text{ is a constant.}$$

  i. Show that $k = \dfrac{5}{8}$.   (2 marks)

  ii. Find the mean and variance of X.   (4 marks)

b. Box A contains 2 yellow and 3 red marbles. Box B contains 2 yellow and 1 red marbles. A box is selected at random and a ball is randomly selected from the box.
  i. What is the probability that the red marble is selected from box A?
                      (2 marks)
  ii. What is the probability of selecting the yellow marble? (2 marks)

Continued...

Question 3 (10 marks)

a. The quiz in a sociology course consists of 10 multiple choice questions. Each question has 5 possible answers and only 1 of the answer is correct. An unprepared student makes a random guesses for all the answers. Find the probability that:
    i.   the students get 6 correct answers.   (2 marks)
    ii. the students get at most 3 wrong answers .   (3 marks)

b. The mean length of a wooden stick is found to be 120 cm with a standard deviation of 18 cm. In a random sample of 40 wooden sticks, find the probability that the mean length of the sticks will be:
    i.   at least 118 cm.   (2 marks)
    ii. within 5 cm of the population mean.   (3 marks)

Question 4 (10 marks)

a. The time (minute) taken by all 4 teams to finish their task in a competition are given below:

    36   47   36   21

    i. List all possible samples of size two, without replacement from the given
        population and hence determine its sample mean.   (3 marks)
    ii. Construct the sampling distribution for the frequency and probability of
        the sample mean.   (2 marks)

b. Assuming that the population is normally distributed. A sample is selected with the given list 1,2,3,4,5,6,7,8

    i. Find the mean and the standard deviation.   (2 marks)
    ii. Construct a 95% confidence interval for the population mean.   (3 marks)

Question 5 (10 marks)

a. Write the null and alternative hypothesis for the following and determine if it is a two-tailed, a left-tailed or a right-tailed test.
    i.   A company that manufactures chocolate bars is concerned that the
         mean weight of a chocolate bar is not greater than 170 grams.
                                                                         (2 marks)
    ii. An investment company claims that the annual mean dividend givens to
         its investors is at least 22 percents.   (2 marks)

Continued...

b.   A manager of a fast food restaurant wants to determine whether the population mean waiting time to place an order has changed in the past month. Assuming the population is normally distributed with population mean waiting time to place an order is 4.5 minutes and standard deviation of 1.2 minutes. The manager selects a sample of 25 orders during a one-hour period and found that the sample mean is 5.1 minutes. Set up the hypothesis, H_0 and H_1, and test at the 5% level of significance that the population mean waiting time to place on order has changed. What is the conclusion?   (6 marks)

End of Paper

APPENDIX

Formulae:

1.

	Ungrouped data	Grouped data
Mean:	$\bar{x} = \dfrac{\sum x}{n} \qquad \mu = \dfrac{\sum x}{N}$	$\bar{x} = \dfrac{\sum mf}{n} \qquad \mu = \dfrac{\sum mf}{N}$
Variance:	$s^2 = \dfrac{\sum x^2 - \dfrac{\left(\sum x\right)^2}{n}}{n-1}$ $\sigma^2 = \dfrac{\sum x^2 - \dfrac{\left(\sum x\right)^2}{N}}{N}$	$s^2 = \dfrac{\sum m^2 f - \dfrac{\left(\sum mf\right)^2}{n}}{n-1}$ $\sigma^2 = \dfrac{\sum m^2 f - \dfrac{\left(\sum mf\right)^2}{N}}{N}$
Median:		$L + \left[\dfrac{\left[\dfrac{\sum f + 1}{2}\right] - F_L}{f_m}\right] w$
Mode:		$L + \left[\dfrac{f_m - f_B}{(f_m - f_B) + (f_m - f_A)}\right] w$

2.

	Mean	Variance
Discrete Random Variable X	$\mu = E(X)$ $= \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ where $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X)$ $= \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ where $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

3.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x) = \dbinom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \dfrac{e^{-\lambda}\lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$